



Trench Excavation

A necessary consideration in the planning of sewer, pipeline, and similar subsurface work by the cut and cover (trench and backfill) method is preventing trench wall cave-in and soil movement. Either, or both, may result in death or serious injury to workers, plus damage to adjacent structures, utilities, and facilities.

1. The hazards of trench excavation are:
 - a. Death by suffocation or crushing when falling soil buries a worker.
 - b. Materials falling on a worker in the trench.
 - c. Falls of persons when climbing into or out of the excavation.
 - d. Men working too close together.
 - e. Stumbling over equipment or excavated material or falling into the trench.
 - f. Encountering toxic, irritating or flammable gases.
2. Caving of side walls is the worst hazard. Most accidents of this type occur because:
 - a. Taking a chance without shoring; or inadequate shoring in an attempt to reduce cost.
 - b. Inadequate knowledge of the shoring necessary or misjudgment of soil stability.
 - c. Failure of apparently adequate shoring due to unexpected or transient loads superimposed on the shoring structure or ground surface at the edge of the trench, or from vibration due to traffic.
 - d. Use of defective shoring material.
 - e. Failure to maintain shoring properly after changes incidental to operations, or after damage by washouts or heavy rains.
 - f. Failure to place removed soil at a safe distance from the edge of the excavation.
 - g. Undercutting of trench walls by trenching machines not properly leveled.
3. Proper sheeting and bracing (shoring) will prevent both cave-in and probable soil movement.
4. Proper trench shoring cannot be reduced to a standard formula. Each job must be treated as an individual problem because of the variable conditions existing on each job. Some of the important factors to be considered in planning the job are:
 - a. **Nature of soil structure.** Soil structure varies from hard rock at one extreme to soil containing sufficient water to produce hydrostatic pressure. Hard rock may contain faults in strata which make it unstable when cut through. Normal moisture content must be considered in determining margins of safety. Sandy soil, or soil which has been back filled, is very unstable and usually requires tight sheeting; where the trench depth exceeds four feet.

- b. **Fluctuating weather and moisture conditions.** Rainfall, freezing and thawing, overflow of adjacent streams, storm drains, or sewers, and melting of snow all produce change in the condition of the soil that should be considered. Water from any source probably will increase the rate of seepage, and may reduce the cohesion of the soil or saturate the soil thereby increasing the pressure on the sheeting and bracing. A trench in frozen ground may be safe with little or no sheeting; thawing may cause the entire bank to cave.
- c. **Proximity of other structures or sources of vibration.** Shoring not otherwise necessary may be needed to prevent dislocation of foundation soil or structure of an adjoining building, or of curb lines, trees, or utility poles. Also to be considered is vibration which may arise from machine operations (as from punch presses or forging hammers) in nearby buildings, passing vehicular or railway traffic, or blasting. Equipment used on the job (such as material trucks, pile drivers, air spades, or power ramrods) may also produce vibration which should be considered in planning shoring.
- d. **Trench dimensions.** As width of the trench increases, the cross braces or struts must be increased in cross-section to maintain the necessary rigidity. Remember that with soil possessing sufficient cohesion to act as a solid, the side pressures reach a maximum at a point slightly higher than one-half the depth of the cut...and with dry granular and saturated soils, the side pressures increase in proportion to the depth of the excavation.

Standard shoring tables are available in any safety manual, and should be consulted before excavation begins. Greater factors of safety should be provided as required by job conditions. Heavier than minimum size of materials will usually be required if the trench is to be kept open for a considerable period.

HOW THIS TOPIC APPLIES TO THIS JOB:

ATTENDEES: Print Name / Signature (use back if necessary)

DATE:

SUPERVISOR / FOREMAN SIGNATURE:

JOBSITE / PROJECT#:
